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[Title of Invention]

Ultraviolet absorption transparent material

[Abstract]

[Object] An ultraviolet absorption transparent material, which can shade ultraviolet rays, and in particular, can especially sharply shade the boundary of the ultraviolet/visible region near 400 nm without reducing the optical characteristics, and is excellent in the adhesion, the chemical resistance, the marring resistance, and the durability, is obtained.

[Construction] An ultraviolet absorption transparent material obtained, after coating a synthetic resin-base primer coating solution added with the solution of an ultraviolet absorbent containing at least a fluorescent brightening agent and particularly an indole-base compound on the surface of a transparent base material followed by heat-curing at a relatively low temperature to form an ultraviolet absorbing thin film, by successively coating a silicone-base hard coating solution of a siloxane prepolymer dissolved in an organic solvent and curing by heating to form a protective thin film. Also, the ultraviolet absorption transparent material, wherein the synthetic resin-base primer coating solution is an acrylic primer coating solution.

[Claims]

[Claim 1] An ultraviolet absorption transparent material obtained, after coating a synthetic resin-base primer coating solution added with the solution containing a fluorescent brightening agent and an ultraviolet absorbent on the surface of a transparent base material followed by heat-curing to form an ultraviolet absorbing thin film, by successively coating a silicone-base hard coating solution of a siloxane prepolymer dissolved in an organic solvent and curing by heating to form a protective thin film, characterized by containing at least an indole-base compound as the ultraviolet absorbent.

[Claim 2] The ultraviolet absorption transparent material described in claim 1 wherein the synthetic resin-base primer coating solution is an acrylic primer coating solution.

[Detailed Description of the Invention]

[0001]

[Industrial Field of Application] The present invention relates to a transparent material coated with a coating film excellent in the ultraviolet absorbing property. The material is an ultraviolet absorption transparent material useful for various kinds of window materials of, for example, buildings, houses, vehicles, vessels, airplanes, etc., as ultraviolet shading filter members.

[0002]

[Prior arts and its Problems] Hitherto, the treatment method of imparting an ultraviolet absorbing property to a transparent material such as a glass base is generally classified into following three kinds, which are known.

[0003] First, (1) a method of compounding a transparent material itself with an ultraviolet absorbing compound. For example, there are various glass compositions each obtained by melt-adding a metal compound into a glass (e.g., Japanese Patent Laid-Open No. 47812/1977) and various resin films each obtained by adding by dispersion an ultraviolet absorbent in a resin film (e.g., Japanese Utility Model Laid-Open No. 17925/1984), etc. Then, (2) a method of sticking an ultraviolet absorbing transparent film to the surface of a transparent material. For example, a laminated glass obtained by inserting a polyvinyl butyral intermediate film containing an ultraviolet absorbent between glass sheets (e.g., Japanese Patent Laid-Open No. 32352/1981), etc. Furthermore (3) a method of forming an ultraviolet absorbing film on the surface of a transparent material. For example, by applying a vapor phase film-forming method such as sputtering onto a base material which is a transparent material (e.g., Japanese Patent Laid-Open No. 76083/1992), or a liquid phase film-forming method such as sol-gel, etc., (e.g., Japanese Patent Laid-Open No. 97103/1992), etc.

[0004] On the other hand, recently, in a resin base material, a method of obtaining a transparent synthetic resin sheet, which cuts at least 90% ultraviolet rays and has a visible light transmittance of at least 80%, by a high-temperature high-pressure dyeing method or a normal pressure carrier method utilizing a dispersion type fluorescent paint having a brightening action, for example, 2,5-bis(5'-tertiary butylbenzoxazolyl)thiophene, etc., is known (e.g., Japanese Patent Laid-Open No. 126503/1986).

[0005]

[Problems that the Invention is to Solve] As described above, the methods described, for example, in the above-described Japanese Patent Laid-Open No. 47812/1977 and Japanese Utility Model Laid-Open No. 17925/1984, etc., are unsuitable for a small-amount many-kind production, in the product in which the absorption wavelength reaches the boundary (for example, about

400 nm) of the ultraviolet/visible region, is liable to form fog, etc., of the film, and it is hard to say that the control is easy.

[0006] Also, in the method described in the above-described Japanese Patent Laid-Open No. 32352/1981, the chemical resistance, the marring resistance, the durability, coloring and fog are improved comparing to the case of single resin film, but the form correspondence is bad and the thickness becomes considerably thick and the product is hard to become light weight.

[0007] Furthermore, in the method of the above-described Japanese Patent Laid-Open No. 76083/1992 or the method of the above-described Japanese Patent Laid-Open No. 97103/1992, a large amount of an organic compound, which is liable to be decomposed, cannot be used, since the inorganic compound becomes an absorption base, ultraviolet rays cannot be sufficiently sharply cut up to the boundary (about 400 nm) of the ultraviolet/visible region, and also, since for forming film, raising of the temperature of the base and burning thereof are inevitable, the methods can be applied only to a base having a heat resistance. Furthermore, by only the organic resin coating film containing a large amount of a simple ultraviolet absorbent, the product becomes inferior in the chemical resistance, the marring resistance, and the durability.

[0008] Moreover, in the method described in the above-described Japanese Patent Laid-Open No. 126503/1986, ultraviolet rays are shaded by absorbing without using an ultraviolet absorbent, and the transparency is excellent, but, in particular, actually, a fluorescence becomes too remarkable, and the durability is considerably inferior for practical use.

[0009]

[Means for Solving the Problems] The present invention has been made in view of such problems in prior art, it has been found that for very sharply cutting the boundary of the ultraviolet/visible region, a fluorescent brightening having an absorption near the bounder and an ultraviolet absorbent are used together, and a fluorescence can be prevented and coloring caused by using a large amount of an ultraviolet absorbent can be prevented; by mixing them, a synthetic resin-base primer composition having a good adhesion to the surface of a transparent base material is prepared to provide a coating solution, which can form a film at a relatively low temperature, and by further protecting the film thus formed with a silicone-base hard coating film, a useful ultraviolet absorption transparent material, which sharply shades ultraviolet rays near particularly 400 nm and is excellent in the chemical resistance, the marring resistance, and the

durability capable of being used as external cladding, is provided.

[0010] That is, the present invention provides an ultraviolet absorption transparent material obtained, after coating a synthetic resin-base primer coating solution added with the solution containing a fluorescent brightening agent and an ultraviolet absorbent on the surface of a transparent base material followed by heat-curing to form an ultraviolet absorbing thin film, by successively coating a silicone-base hard coating solution of a siloxane prepolymer dissolved in an organic solvent and curing by heating to form a protective thin film, wherein the ultraviolet absorbent contains at least an indole-base compound as the ultraviolet absorbent.

[0011] Also, the invention provides the ultraviolet absorption transparent material described above wherein the synthetic resin-base primer coating solution is an acrylic primer coating solution.

[0012] Now, as described above, as the above-described fluorescent brightening agent, any material may be used as long as the material absorbs in the ultraviolet region, emits a fluorescence in the visible region, can be melt-added to a synthetic resin-base primer, particularly to an acrylic primer coating agent, and does not change the coated film thereof by heat-curing at a relatively low temperature, and there are, for example, UVITEX-OB (2-(3,5-di-*t*-butyl-2-hydroxyphenyl)-5-chlorobenzotriazole, manufactured by Ciba-Geigy Corporation) and EB-501 (manufactured by Mitsui Toatsu Senryo K.K.), etc., which have a proper heat resistance and in which the absorption wavelength is in the ultraviolet/visible region boundary (e.g., about 400 nm). Also, the addition amount of, for example, the above-described UVITEX-OB is from about 0.02 to 0.5% by weight. When the addition amount thereof is less than 0.02% by weight, the effect thereof is not obtained, while when the addition amount exceeds 0.5% by weight, the concentration becomes near the limit of the solubility, hence the recrystallization occurs to liable to cause a coated film defect, and also the addition of more than necessary becomes uneconomical.

[0013] Also, as the above-described ultraviolet absorbent which is used together with, there is, for example, BONASORB-UA3901 (manufactured by Orient Kagaku K.K.), which is at least an indole-base compound, and particularly, the absorption wavelength thereof has the effect in the ultraviolet/visible region boundary (e.g., about 400 nm), and as other materials, there are, for example, a benzophenone-base, a benzotriazole-base, a benzoate-base, a cyano acrylate-base, and a salicylate-base, and there are TINUVIN 327 (manufactured by Ciba-Geigy Corporation), NIOSORB 100 (2,4-dihydroxybenzophenone, manufactured by Kyodo Yakuhin K.K.), SEESORB 706 (2-(2'-

hydroxy-5'-methyl-3'-(3",4",5",6"-tetra-hydrophthalimidylmethylphenyl)benzotriazole, manufactured by Shipro Kasei K.K.), and SEESORB 712 (2,4-di-t-butylphenyl-3'5' - di-t-butyl- 4'-hydroxy benzoate, manufactured by Shipro Kasei K.K.). Also, the addition amount of, for example, the above-described BONASORB-UA3901 is from 0.02 to 0.3% by weight. When the addition amount is less than 0.02% by weight, the effect thereof is not obtained and when the addition amount exceeds 0.3% by weight, the coated film becomes yellowish, which becomes gradually remarkable. Also, the addition amounts of the above-described TINUVIN 327, NIOSORB 100, and SEESORB 706 and 712 are from about 0.1 to 1.5% by weight, and when the addition amounts are less than 0.1% by weight, the effect thereof is not obtained, and when the addition amounts exceed 1.5% by weight, the concentration becomes near the limit of the solubility, hence the recrystallization occurs to liable to cause a coated film defect, and the addition of more than necessary becomes uneconomical.

[0014] The using ratio of the fluorescent brightening agent and the total ultraviolet absorbents is from about 1 : 0.5 to 1 : 10 by weight ratio, and preferably from about 1 : 3 to 6 : 1 by weight ratio. When the content of the fluorescent brightening agent becomes larger, the see-through is deteriorated by fluorescence, and when the content thereof is too less, the desired ultraviolet absorbing power is not obtained.

[0015] Furthermore, about the synthetic resin primer, particularly the acrylic primer, since it is necessary to sufficiently dissolve the above-described fluorescent brightening agent and ultraviolet absorbent, it is better to use a mixed solvent of a combination of an ether alcohol-base solvent such as ethyl cellosolve, etc., and a ketone alcohol-base solvent such as diacetone alcohol, etc., or a ketone, an ether, or an aromatic solvent for considering that the transparent base material is not damaged. Particularly, in the case of using a glass sheet form materials, etc., as the transparent base material, a ketone-base solvent such as cyclohexanone having a dissolving power is preferred.

[0016] Furthermore, as the above-described synthetic resin, there are, for example, acrylic resins, urethane-base resins, fluorine-base resins, and polyester-base resins, and in these resins, as the above-described acrylic resin, by utilizing a commercially available acrylic resin, for example, Dianal BR 88, 85, or 80 (manufactured by Mitsubishi Rayon Co., Ltd.), etc., the coating solution may be prepared by the relations of a concentration, a viscosity, or a film thickness. It is preferred that the concentration of the resin component is from about 1 to 15% by weight, the total concentrations of the fluorescent brightening agent and the ultraviolet absorbent are

from about 0.5 to 2% by weight, the viscosity is from about 10 to 500 cp, and further, the film thickness is from about 2 to 8  $\mu$ . In particular, the thickness of the topcoat is about 3  $\mu$ , and the sum total film thickness is from about 5 to 11  $\mu$ .

[0017] In addition, when the transparent base material is a glass-made base material, to improve the adhesion, it is better to utilize an adhesion-improving agent such as a silane coupling agent and it is preferred to add, for example, OS808A (silicone-modified acrylic resin, manufactured by Daihachi Chemical Industry Co., Ltd.), etc., in an amount of from about 1/4 to 4 of the resin component concentration. The addition amount thereof is from about 1 to 20% by weight, and when the addition amount is too less, the effect is not obtained, and when the addition amount is too much, it becomes uneconomical.

[0018] Still further, the above-described ultraviolet absorbing synthetic resin primer prepared as described above, particularly the above-described ultraviolet absorbing acrylic primer is coated by, for example, a dipping method, a spraying method, a flow coating method, a spin coating method, or a printing method, etc., to form a film having a uniform film thickness, and the coated film is dried by heating at a temperature of at least about 80°C for about one hour. When heating is insufficient, the primer component elates onto the protective film, which is a silicone-base hard coat, whereby, for example, fog, cracks, etc. are liable to cause, and when heating becomes excessive, the adhesion of the protective film, which is the silicone-base hard coat, is deteriorated.

[0019] Also, as the above-described silicone-base hard coating solution, fundamentally, a solution using an alcohol solution of a siloxane prepolymer obtained by hydrolyzing an organo alkoxysilane as the base is preferred, and, for example, a liquid containing a colloidal silica such as the coating composition described in Japanese Patent Laid-Open No. 220531/1987 already proposed by the present applicant is excellent in the marring resistance and is more preferred. In addition, as the commercially available products, for example, Tosquard 510 (manufactured by Toshiba Silicone Co., Ltd.) and Si Coat 2 (manufactured by Daihachi Chemical Industry Co., Ltd.) can be utilized.

[0020] Moreover, as the coating environment, for example, the temperature is from about 15 to 25°C, the humidity is from about 40 to 50 RH%, and further the clean extent is preferably lower than about 10,000 in the point of preventing a coated film defect. Also, as the coating method, similarly to the case of the above-described ultraviolet absorbing synthetic resin primer, particularly the ultraviolet absorbing acrylic primer, a coating method giving a uniform film thickness, such

as a dipping method, a spraying method, a flow coating method, a spin coating method, or a printing method can be utilized. The film thickness is preferably from about 2 to 5  $\mu$ . When the film thickness is thin, the surface protective effect is not obtained and when the thickness is thick, cracks are liable to cause while drying and curing by heating. Furthermore, for drying and curing by heating, a temperature of at least about 80°C is preferred, and particularly, when the transparent base material is a glass plate-form material, etc., the treatment at a temperature of about 150°C for about two hours is preferred for increasing the surface hardness.

[0021] In addition, for improving the coating performance of the above-described ultraviolet absorbing acrylic primer or silicone-base hard coating solution, as a matter of course, a flow improving agent or a rheology-controlling agent may be properly added.

[0022] Moreover, as the above-described transparent base material, a material having the heat resistance of, for example, at least about 80°C may be used, and there are preferably inorganic glasses and resin glasses such as PC, PMMA, PET, etc., and regardless of inorganic and organic, there is no particular restriction on the form thereof, and various forms are used. Also about the size and the construction, for example, a bent plate glass is as a matter of course, various tempered glasses, strength-up glasses, flat plates, a single plate can be used, and composite glasses and laminated glasses can be, as a matter of course, used.

[0023]

[Action] As described above, since the invention is a transparent material coated with the coating film excellent in the ultraviolet shading property having a specific constitution and a sufficient protective film, wherein a primer solution containing a fluorescent brightening agent and an ultraviolet absorbent particularly contains at least an indole-base compound as the fluorescent absorbent, and the addition amount can be reduced, a fluorescence of the fluorescent brightening agent is absorbed by the fluorescent absorbent and a film can be formed at a relatively low temperature as a non-striking coated film. Further, the surface thereof becomes hard, particularly, the absorption power can be increased near 400 nm, and the boundary of the ultraviolet/visible region can be very sharply cut with transparent and without being colored, whereby a transparent ultraviolet absorption transparent material, which is excellent in the adhesive property, the chemical resistance, marring resistance, and the durability, can be used for external cladding, and can become a useful

ultraviolet shading window, etc., can be obtained easily by a simple coating treatment at a low cost.

[0024]

[Examples] Then, the invention is explained by the following examples but the invention is not limited to the examples

[0025] (Preparation of ultraviolet absorbing acrylic primer)

[For glass coating]

In a round-bottom flask equipped with a stirrer and a circulator were placed cyclohexanone and propylene glycol monomethyl ether as solvents, and with stirring at room temperature was added Dianal BR-88 or BR-85 (manufactured by Mitsubishi Rayon Co., Ltd.) as acrylic resin. Furthermore, while continuing stirring, UVITEX-OB (manufactured by Ciba-Geigy Corporation) as a fluorescent brightening agent and BONASORB-UA3901 (manufactured by Orient Kagaku K.K.), TINUVIN 327 (manufactured by Ciba-Geigy Corporation), VIOSORB 100 (manufactured by Kyodo Yakuin K.K.), SEESORB 706 (manufactured by Shipro Kasei K.K.), or SEESORB 712 (manufactured by Shipro Kasei K.K.) as a fluorescent absorbent were properly added thereto, and after raising the temperature to about 95°C in an oil bath over a time of about 30 minutes, the mixture was maintained for about 30 minutes to completely dissolve the added components. Then, heating was stopped, the temperature was lowered to normal temperature, and a silicone-modified acrylic resin OS-808A was added followed by dissolving with stirring to obtain an ultraviolet absorbing acrylic primer for glass coating.

[0026] The ultraviolet absorbing acrylic primer solution was transparent and had solid components of from about 8 to 11% and a viscosity of from about 200 to 350 cp (25°C).

(Preparation of ultraviolet absorbing acrylic primer)  
[For resin coating]

In a round-bottom flask equipped with a stirrer and a circulator were placed cyclohexanone, diacetone alcohol, and propylene glycol monomethyl ether as solvents and with stirring at normal temperature, Acryl BR-85 Resin (manufactured by Mitsubishi Rayon Co., Ltd.) was added thereto. Furthermore, while continuing stirring, a fluorescent brightening agent UVITEX-OB (manufactured by Ciba-Geigy Corporation) and an ultraviolet absorbent BONASORB-UA3901 (manufactured by Orient Kagaku K.K.) or TINUVIN 327 (manufactured by Ciba-Geigy Corporation) were added thereto, and after raising the temperature to about 95°C in an oil bath over a time of about 30 minutes, the mixture was maintained for about 30 minutes to completely dissolve the added components to obtain an ultraviolet absorbing acrylic primer for resin coating.



[0027] The ultraviolet absorbing acrylic primer solution was transparent and had solid components of about 2% and a viscosity of about 35 cp (25°C).

(Preparation of silicone-base hard coating solution)

In a 500 ml round-bottom flask equipped with a stirrer and a circulator were placed 100 g of methyl triethoxysilane and 10 g of 3-glycidoxypopyl trimethoxysilane, after adding thereto 0.04 g of phthalic anhydride, the mixture was heated to about 40°C in a warm water bath to dissolve the components. Thereafter, 100 g of a weak basic colloidal silica aqueous solution, Snow Tex C (manufactured by Nissan Chemical Industries, Ltd., mean particle size of about 15  $\mu$ m, SiO<sub>2</sub> content of about 20%) was added, and the reaction was carried out at about 40°C for about 5 days. Then a composition having number average molecular weight by GPC (ULC 802A, manufactured by TOSOH CORPORATION) of about 1100 and solid components of about 29% was obtained. To the composition was added 145 g of isopropyl alcohol, and the mixture was concentrated by a ultrafilter of fraction molecular weight of 1000 (manufactured by Nippon Millipore Co.) to obtain a composition of a number average molecular weight by GPC of about 1200 and solid components of about 20%. By adding about 0.1 part of dicyandiamide to the composition as a curing catalyst, a silicone-base hard coating composition was obtained.

[0028] (Performance evaluation method)

Ultraviolet absorption: The absorption spectral pattern was measured by an ultraviolet/visible spectrometer.

Fluorescent property: Visually observed under natural sunlight in the open air. (Anxious fluorescence, no fog.)

Surface hardness: According to ASTM D1044, truck wheel CS -10F,  $\Delta$ H (haze) value (%) after 500 rotations.

[0029]

Adhesion: According to JIS K5400, cross-cut (1 mm square) tape releasing residue is shown by /100.

Chemical resistance:

Acid --- 25 wt.% H<sub>2</sub>SO<sub>4</sub>, spot test for 24 hours.

[0030]

Base --- 5 wt.% NaOH, spot test for 4 hours.

Solvent --- 100% ethanol, spot test for 4 hours.

Weather resistance: According to JIS D0205, the time until abnormalities (film cracks, releasing, remarkable yellowing) are visually observed by a sunshine carbon weather meter.

[0031] Example 1

A clear float glass base having a size of about 300 mm x 300 mm, and a thickness of about 3 mm was successively washed by a neutral detergent, water rinsing, and an alcohol, and

after drying, wiped with acetone to provide a glass base for coating film.

[0032] One surface of the glass base for coating film was masked with a film, dipped in the ultraviolet absorbing acrylic primer solution for glass coated prepared as described above, pulled up at a speed of about 0.1 cm/sec., and dried at a temperature of about 120°C for about 0.5 hour to form an ultraviolet absorption film of about 6  $\mu$  in thickness.

[0033] Then, the glass base having the ultraviolet absorption film was dipped in the silicone-base hard coating solution prepared as described above, pulled up at a speed of about 1 cm/sec., and dried and cured at about 120°C for about 0.5 hour and at 150°C for about 0.5 hour to form a protective film of about 3  $\mu$  in thickness.

[0034] The obtained ultraviolet shading glass base as an ultraviolet absorption transparent material was evaluated according to the above-described performance evaluation methods. As the results thereof, as shown in Fig. 1, the product was the ultraviolet absorption transparent material which shade ultraviolet rays at the transmittance of 2% or lower in the wavelength of 400 nm or shorter, particularly could very sharply cut the boundary of the ultraviolet/visible region in near 400 nm without being colored with a sufficient transparency, could prevent the occurrences of anxious fluorescence phenomenon and fog, was excellent in the marring resistance such that in the surface hardness, the haze value ( $\Delta H$ ) after taper test was 5, had no visual abnormality about the weather resistance of at least 3000 hours, had no abnormality in the chemical resistance, and had an excellent durability.

[0035] Examples 2 to 5

Using each of the primer solutions shown in Table 1 for the glass base as used in Example, by forming films by the same manner as Example 1, the ultraviolet absorption films as shown in Table 1 were formed.

[0036] Then, each glass base having the ultraviolet absorption film was dipped in Tosguard 510 (manufactured by Toshiba Silicone Co., Ltd.), which was a commercially available silicone-base hard coating solution, pulled up at a speed of about 1 cm/sec., and dried and cured at about 120°C for about 3 hours to form a protective film of about 3  $\mu$  in thickness.

[0037] Each ultraviolet shading glass base, which was an ultraviolet absorption transparent material, obtained was evaluated as in Example 1. The products were desired excellent ultraviolet absorption transparent materials as in Example 1.

Example 6

A PET film having a thickness of about 50  $\mu$  was dipped in the ultraviolet absorbing acrylic primer solution for resin coating shown in Table 1, pulled up at a speed of about 0.1 cm/sec., and dried at about 120°C for about 0.5 hour to form an ultraviolet absorption film of about 5  $\mu$  in thickness.

[0038] Then, the film having the ultraviolet absorption film was dipped in the silicone-base hard coating solution prepared as described above, pulled up at a speed of about 1 cm/sec., and dried and cured at about 120°C for about 0.5 hour and at about 150°C for about 0.5 hour to form a protective layer of about 3  $\mu$  in thickness.

[0039] The ultraviolet shading film, which was an ultraviolet absorption transparent material, obtained was evaluated as in Example 1. The product was a desired excellent ultraviolet absorption transparent material as in Example 1.

#### Comparative Example 1

By following the same procedure as Example 1 except that the ultraviolet absorbing acrylic primer prepared with the ultraviolet absorbent, TINUVIN 327 (manufactured by Ciba-Geigy Corporation) as shown in Table 1 was used, an ultraviolet absorbing glass base was obtained.

[0040] About the ultraviolet absorbing glass base obtained, the appearance was good, but the absorption did not reach the wavelength 400 nm at all, the weather resistance was about 1000 hours, and it was hard to say that the product was a desired ultraviolet absorption transparent material at all.

#### [0041] Comparative Example 2

By following the same procedure as Example 1 except that the ultraviolet absorbing acrylic primer prepared with the fluorescent brightening agent, UVITEX-OB (manufactured by Ciba-Geigy Corporation) as shown in Table 1 was used, an ultraviolet absorbing glass base was obtained.

[0042] About the ultraviolet absorbing glass base obtained, only a slight blue fluorescence was seen in appearance, but as shown in Fig. 1, although the product cut near the wavelength of near 400 nm, the ultraviolet in the ultraviolet range to the wavelengths could not be cut, the weather resistance was about 300 hours, and it was hard to say that the product was a desired ultraviolet absorption transparent material at all.

#### [0043] Comparative Example 3

By following the same procedure as Example 1 except that the ultraviolet absorbing primer prepared with the fluorescent brightening agent, UVITEX-OB (manufactured by Ciba-Geigy Corporation) and the ultraviolet absorbent, TINUVIN 327 (manufactured by Ciba-Geigy Corporation) as shown in Table 1 was used, an ultraviolet absorbing glass base was obtained.

[0044] About the ultraviolet absorbing glass base obtained, the product was almost colorless and was transparent in both the interior-of-a-room side and the outside in appearance, the cut of near 400 nm was insufficient, the weather resistance was about 1000 hours, and it was hard to say that the product was a desired ultraviolet absorption transparent material at all.

[0045] Comparative Example 4

By following the same procedure as Example 1 except that the ultraviolet absorbing primer prepared with the ultraviolet absorbent, BONASORB 327 (manufactured by Ciba-Geigy Corporation) as shown in Table 1 was used, an ultraviolet absorbing glass base was obtained.

[0046] About the ultraviolet absorbing glass base obtained, the product was transparent to the extent of showing slightly yellowish feeling in appearance, but the cut the ultraviolet rays in the range as center near the wavelength of 350 nm was insufficient, the weather resistance was about 500 hours, and it was hard to say that the product was a desired ultraviolet absorption transparent material at all.

[0047]

[Table 1]

	Acrylic Resin (wt.%)	UV Brightening Agent (wt.%)	UV Absorbent (wt.%)	Solvent (wt.%)	Adhesive Improving Agent (wt.%)	Solid Components (%)	Viscosity (cp)	Primer Film Thickness ( $\mu$ )
Ex. 1	(a) 5	(b) 0.1	(c) 0.1 (c') 0.5	(d) 42.0 (d') 42.3	(e) 10	9	250	<sup>6</sup> Top is 3
2	(a) 5	(b) 0.2	(c) 0.05 (c') 1.0	(d) 42.0 (d') 41.55	(e) 10	9	260	<sup>7</sup> Top is 3
3	(a) 4	(b) 0.3	(c) 0.05 (c'') 1.5	(d) 40.0 (d') 39.15	(e) 15	10	230	<sup>5</sup> Top is 3
4	(a) 6	(b) 0.4	(c) 0.2 (c'') 1.2	(d) 44.0 (d') 43.4	(e) 5	8	300	<sup>5</sup> Top is 3
5	(a) 4	(b) 0.1	(c) 0.05 (C') 0.3 (c'') 0.2	(d) 42.0 (d') 43.35	(e) 10	8	200	<sup>4</sup> Top is 3
6	(a) 7	(b) 0.1	(c) 0.1 (c') 0.5	(d) 6.0 (d') 60.3 (d'') 22.0	(e) 2	11	350	<sup>7</sup> Top is 3
CEx. 1	(a) 5		(c') 0.5	(d) 42.0 (d') 42.5	(e) 10	9	240	<sup>5</sup> Top is 3
2	(a) 5	(b) 0.1		(d) 42.0 (d') 42.9	(e) 10	9	240	<sup>5</sup> Top is 3
3	(a) 5	(b) 0.1	(c') 0.5	(d) 42.0 (d') 42.9	(e) 10	9	250	<sup>5</sup> Top is 3
4	(a) 5		(C) 0.1	(d) 42.0 (d') 42.9	(e) 10	9	240	<sup>5</sup> Top is 3

Ex: Example,

C.Ex.: Comparative Example

[0048] In the Table; (a) shows Dianal BR88, (a') Dianal BR85 (both, manufactured by Mitsubishi Rayon Co., Ltd.), (b) UVITEX-OB (manufactured by Ciba-Geigy Corporation), (c) BONASORB-UA3901 (manufactured by Orient Kagaku K.K.), (c') TINUVIN 327 (manufactured by Ciba-Geigy Corporation), (c'') VIOSORB 100 (manufactured by Kyodo Yakuhin K.K.), (C''') SEESORB 706 (manufactured by Shipro Kasei K.K.), (c''') SEESORB 712 (manufactured by Shipro Kasei K.K.), (d) cyclohexanone, (d') propylene glycol monomethyl ether, (d'') diacetone alcohol, and (e) silicone-modified acrylic resin: OS 808A (manufactured by Daihachi Chemical Industry Co., Ltd.).

[0049]

[Effect of the Invention] As described above, according to the present invention, a useful ultraviolet absorption transparent material which is transparent and shade ultraviolet rays, particularly very sharply shade ultraviolet rays at the boundary of ultraviolet/visible region near 400 nm without reducing the optical characteristics, is excellent in the adhesion, the chemical resistance, the marring resistance and the durability, can be used as external cladding, and can be widely used in various field such as houses, vehicles, etc., can be provided easily at a low cost.

[Brief Explanation of the Drawing]

[Fig. 1] is a graph showing the transmittances by ultraviolet/visible spectral curves in the ultraviolet absorption transparent material of Example 1 of the invention, a usual glass base (float glass of 3 mm thick), and ultraviolet absorbing glass bases of Comparative Examples 1 to 4.

[Fig. 1]

- |                         |                    |
|-------------------------|--------------------|
| 1 Transmittance (%)     | 2 Usual glass base |
| 3 Comparative Example 1 | 4 Example 1        |
| 5 Wavelength (nm)       |                    |